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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
ELEY, JESSICA L	

ART UNIT	PAPER NUMBER
2884	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/528,661	OYAIZU ET AL.	
	Examiner	Art Unit	
	JESSICA L. ELEY	2884	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 July 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4,8,11,13,14,18 and 20-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4,8,11,13,14,18 and 20-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments filed 30 July 2008 have been fully considered but they are not persuasive.

Applicant has amended claims 1 and 11 to include the limitation of an adhesive layer that transmits light. As such, the pertinent rejection of the new independent claims is the 103(a) rejection based on Takahara in view of Sato, Tran, Okumura, and Matsuda.

In response to applicant's argument that the references individually do not contain all of the limitations, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

Applicant's arguments with respect to claims 1 and 11 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-5, 8, 11, 13, 14, 18, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahara et al. US 6,392,248 (henceforth referred to as Takahara) in view of

Sato et al. US 6,429,430 (henceforth referred to as Sato), Tran et al. US 5,545,899 (henceforth referred to as Tran), Okumura et al. US 6,384,417 (henceforth referred to as Okumura), Ohara et al. US 6,394,650 B1 (henceforth referred to as Ohara), and Matsuda et al. US 5,640,016 (henceforth referred to as Matsuda).

With regards to **claims 1, 2, 4 and 8**, Takahara disclose a phosphor sheet for a radiation detector comprising:

A support **6** (Figure 3) having a sheet shape;

A phosphor layer **7** (Figure 3) provided on the support **6**, wherein the phosphor layer emits light in response to incident X-rays (column 7, lines 37-43) and wherein the phosphor layer contains a europium activated gadolinium oxysulfide phosphor with the europium within the cited concentration range (column 17, lines 48-49) and the phosphor satisfying the cited formula (i.e. R=Gd and a=0.3).

However, Takahara does not specifically disclose that the phosphor layer has a surface that is layered on the photoelectric conversion film. Instead, Takahara provides the phosphor layer on a support with no mention of bonding a photoelectric conversion film using an adhesive that transmits light.

Tran teaches a conventional X-ray detector employing a scintillating phosphor **16** (Figure 1), wherein the phosphor layer (gadolinium oxysulfide doped with europium) is layered on an array of photoelectric conversion modules **12**. Tran teaches that the phosphor is typically formed on the photoelectric device, thus obviating the need for the separate support disclosed by Takahara. However, Sato teaches that fabricating the phosphor on a separate support and then combining the phosphor with the photoelectric conversions device is advantageous (column 1,

lines 46-52). As would be apparent to one of ordinary skill in the art, such a configuration allows for remote processing of each device without concern of fabrication compatibility issues.

Thus, it would have been obvious for a person having ordinary skill in the art at the time the invention was made to provide the phosphor on a support and layer the phosphor sheet on a photoelectric conversion device, so as to enable the device to be used as conventional X-ray detector while allowing remote processing of the different components, as taught by Tran and Sato.

Further, Takahara, Tran and Sato are silent with regards to bonding the phosphor layer with the photoelectric conversion layer using an adhesive that transmits light. However, transparent adhesives are known in the art of X-ray imaging. For example, Matsuda teaches a transparent adhesive **3** (column 3 lines 1-3) being used for optically connecting a scintillator and a photodiode. Thus, it would be obvious to a person of ordinary skill in the art at the time the invention was made to attach the phosphor sheet and the photoelectric conversion device using a transparent adhesive such as the one taught by Matsuda, as a person with ordinary skill has good reason to pursue the known options within his or her technical grasp.

Further, Takahara is silent with regards to the surface of the phosphor layer having a surface roughness of less than 0.3μm in average roughness.

Okumura disclose the use of a europium-activated gadolinium oxysulfide phosphor in an X-ray detector, wherein the phosphor is coupled to a photodiode detector array (column 4, lines 20-25). Okumura teaches that in such a scenario it is beneficial to provide a surface roughness for the phosphor between 0.01μm and 0.8μm, so as to improve the matching characteristics of the phosphor with a photodiode, thereby improving the output characteristics of the phosphor

(column 3, lines 32-38). Okumura further disclose an example of surface roughness less than 0.3μm (column 8, lines 30-36).

Thus, it would have been obvious for a person having ordinary skill in the art at the time the invention was made to provide a surface roughness less than 0.3μm so as to improve the matching characteristics of the phosphor and photodiode thereby improving light output of the phosphor, as taught by Okumura.

Furthermore Takahara, Tran, Sato, and Okumura do not specifically teach the details of the rare earth oxysulfide phosphor powder such that the average particle size is in a range of 2 μm to 15 μm, the filling factor of the phosphor powder is in a range of 60% to 80%, and the overall phosphor layer has a thickness in a range of 80 to 300 μm. All of these characteristics are known in the teachings of radiographic imaging. Ohara discloses a gadolinium oxysulfide phosphor (column 9, line 27) for use in an X-ray imaging system, wherein the filling factor of the phosphor layer is greater than 60% for a particle size of 2μm to 7μm (column 6, lines 50-67). Ohara further notes that a reduced filling factor increases light scattering, resulting in reduced sharpness (column 19, lines 15-22). Thus, it would have been obvious for a person having ordinary skill in the art at the time the invention was made to use a filling factor greater than 60% so as to decrease light scattering and improve image sharpness, as taught by Ohara. It would have been further obvious to choose a filling factor less than 80%, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Furthermore Ohara teaches the preferable thickness of phosphor layer is 50 to 400 μm (column 11 lines 65-67). It would be obvious to one of ordinary skill in the art at the time the

invention was made to use the thickness taught by Ohara when implementing a phosphor layer with the particle size and fill factor taught by Ohara because, one of ordinary skill in the art at the time the invention was made would have a predictable result at this thickness since they would be repeating the characteristics of the layer taught by Ohara, and Ohara teaches that this layer is capable of enhancing the detectability of fine mineral images as well as detectability of tumor, while maintaining low exposure to radiation (column 2 lines 21-25).

With regards to **claim 11**, the combination of Takahara, Tran, Sato, Okumura, Matsuda, and Ohara as applied to claim 1 above discloses all the limitations of the phosphor sheet, as discussed above. Further, the combination suggests that the phosphor sheet may be used in a layered arrangement with a photoelectric conversion film, in the form of a photodiode layer **52**, for X-ray detection. In addition, Tran teach the use of a TFT readout system, which is conventional in the art (for example, see US Patent # 6,791,091), for reading out the electric charges generated by the photodiodes in order to form an image signal (column 5, lines 23-31; column 6, lines 47-53). Thus, it would have been obvious for a person having ordinary skill in the art at the time the invention was made to employ a charge information reading section since such systems are conventionally known for reading out image information from a detector array.

The combination doesn't specifically address the material for the photoelectric conversion film. However, amorphous silicon or single crystal silicon films are well known in the art as photodetectors (i.e. conversion of light energy into electrical signals). Thus, it would have been obvious for one having ordinary skill in the art at the time the invention was made to use amorphous silicon or single crystal silicon for the photoelectric conversion film, since it has been held to be within the general skill of a worker in the art to select a known material on the

basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

With regards to **claim 13**, Tran further disclose that the TFT readout matrix comprises a charge storage capacitor **54** for storing the charge from the photodiode **52** and TFT switching elements **40**, **48**, **50** corresponding to each pixel for reading out the electric charges (column 5, lines 23-28).

With regards to **claim 14**, Tran suggests that conventional X-ray detectors involve an array of pixel elements (column 1, lines 47-49).

With regards to **claim 18**, Takahara suggests the use of the phosphor in a film based radiographic examination (Figure 2) while Tran and Sato suggest coupling the phosphor with a photoelectric conversion device, as addressed with respect to claim 11 above.

With regards to **claim 20**, Takahara further discloses the coated phosphor powder with average particle sizes of 2.0μm (column 17, lines 48-49). As such, Takahara does not specifically address an average particle size between 6μm and 10μm. However, it would have been obvious for a person having ordinary skill in the art at the time the invention was made to choose an average particle size between 6μm and 10μm, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Claim 21-24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takahara, Sato, Tran, Okumura, and Matsuda as applied to claims 1 and 11 above, and further in view of Chiola et al. US 4,032,791 (henceforth referred to as Chiola).

Regarding **claim 21 and 23**, the combination of Takahara, Sato, Tran, Okumura, and Matsuda disclose all the limitations of parent claims 1 and 11, as discussed above. However, the combination is silent with regards to the phosphor sheet layer being a slurry coated layer coated on the support form a slurry that includes the powder of the rare earth oxysulfide phosphor activated europium.

Chiola discloses a preferred method for creating a phosphor layer that is created by means of a slurry (column 3 lines 21-24) of rare-earth containing phosphors, including oxysulfides europium-activated material (column 3 lines 12-17). Thus it would be obvious to a person of ordinary skill in the art at the time the invention was made to use a slurry to create the phosphor layer that includes powder of rare earth oxysulfide phosphor, europium-activated, since Chiola teaches that this is a preferred method for producing a flexible layer of phosphor (column 3 lines 5-24).

Regarding **claims 22 and 24**, the combination of Takahara, Sato, Tran, Okumura, Matsuda, and Chiola disclose all the limitations of parent claims 21 and 23, as discussed above. Specifically Okumura disclose the use of a europium-activated gadolinium oxysulfide phosphor in an X-ray detector, wherein the phosphor is coupled to a photodiode detector array (column 4, lines 20-25). Okumura teaches that in such a scenario it is beneficial to provide a surface roughness for the phosphor between 0.01μm and 0.8μm, so as to improve the matching characteristics of the phosphor with a photodiode, thereby improving the output characteristics of the phosphor (column 3, lines 32-38). Okumura further disclose an example of surface roughness less than 0.3μm (column 8, lines 30-36).

Thus, it would have been obvious for a person having ordinary skill in the art at the time the invention was made to provide a surface roughness less than 0.3μm so as to improve the matching characteristics of the phosphor and photodiode thereby improving light output of the phosphor, as taught by Okumura.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jessica L. Eley whose telephone number is (571) 272-9793. The examiner can normally be reached on Monday - Thursday 8:00-6:30 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dave Porta can be reached on (571) 272-2444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jessica L Eley/
Examiner, Art Unit 2884
/David P. Porta/
Supervisory Patent Examiner, Art Unit 2884